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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,406	01/05/2005	Lea Di Cioccio	263098US2X PCT	9919

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
SNOW, COLLEEN ERIN	

ART UNIT	PAPER NUMBER
2813	

NOTIFICATION DATE	DELIVERY MODE
03/19/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary	Application No.	Applicant(s)	
	10/519,406	DI CIOCCIO ET AL.	
	Examiner	Art Unit	
	Colleen E. Snow	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-13 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-13 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5 March 2010 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 10-12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Goesele et al** (USPN 6,150,239) in view of **Sakaguchi et al** (US Patent Application Publication 2003/0170990).

Regarding claim 18, **Goesele et al** disclose a method for transferring an electrically active SiC thin layer from an initial SiC substrate, the method comprising:

performing hydrogen ion implantation through a face of the initial SiC substrate and creating a buried, embrittled film [see col. 4, lines 24-29 and 56-59; see also col. 6, lines 29-33];

fastening the face of the initial SiC substrate after implantation to a face of a target substrate, to obtain a structure [see col. 5, lines 15-25]; and

separating the structure in two parts at a level of the buried embrittled film [see col. 5, lines 15-25].

Goesele et al do not specifically disclose the process of determining hydrogen ion implantation conditions including dose, energy and implantation current that create the buried, embrittled film at a depth, with respect to an implanted face of the initial SiC substrate, wherein an implantation defect concentration in a first 500 nm of implanted SiC is lower than $9x10^{20}$ atoms/cm^3, and a number of acceptor defects compatible with desired electrical properties of an active thin layer is obtained, nor do **Goesele et al** disclose thinning a layer of the SiC remaining fastened to the target substrate to a thickness lower of 500 nm.

Goesele et al do disclose, exemplarily, that the thin film layer is formed to a thickness of 0.58 μm (580 nm), and the hydrogen concentration at the maximum (i.e. at a depth of 580 nm) is approximately $6x10^{21}$ atoms/cm^3 [see col. 10, lines 22-29], but do not disclose the concentration at a depth of 500 nm. However, it is known in the art that it is desirable to minimize the implantation defect concentration in implanted semiconductor thin films; defects and deformations in an active layer due to the implantation of atoms may cause quality issues and may be difficult to repair with a healing anneal. Therefore, the process of optimizing to determine the optimal implantation dose, energy and current in order to minimize the implantation defect concentration and the number of acceptor defects compatible with the desired electrical properties of the active layer is within reasonable and routine optimization processes performed by one of ordinary skill in the art. Generally, differences in process parameters will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature

is critical. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Furthermore, **Sakaguchi et al** disclose a method of forming a thin film **22** on a target substrate **26** by delamination of a layer **22** from an initial substrate **21** [see Figs. 7-11]. Furthermore, **Usenko** discloses thinning the layer **22** [see paragraphs 0245-0251]. It would have been obvious to one of ordinary skill in the art at the time of invention to thin the layer in order to provide a uniform thin active layer on the target substrate [see paragraph 0251].

Regarding claim 10, the prior art of **Goesele et al** and **Sakaguchi et al** disclose the method according to claim 18. Furthermore, **Goesele et al** disclose wherein the fastening includes direct wafer bonding, which comprises molecular adhesion [see col. 5, lines 12-14].

Regarding claim 11, the prior art of **Goesele et al** and **Sakaguchi et al** disclose the method according to claim 18. Furthermore, **Goesele et al** disclose a step of healing annealing of the implantation defects on the thin film [see col. 5, lines 15-17].

Regarding claim 12, the prior art of **Goesele et al** and **Sakaguchi et al** disclose the method according to claim 18. Furthermore, **Goesele et al** disclose wherein the healing annealing is carried out before the separating the thin film from a remainder of the initial substrate, which is carried out before the thinning step of **Sakaguchi et al** [see **Goesele et al**, col. 5, lines 15-25; see also **Sakaguchi et al**, paragraph 0251].

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Goesele et al** (USPN 6,150,239) in view of **Sakaguchi et al** (US Patent Application Publication 2003/0170990) as applied to claims 10-12 and 18 above, and further in view of **Maleville et al** (USPN 6,403,450).

Regarding claim 13, the prior art of **Goesele et al** and **Sakaguchi et al** disclose the method according to claim 11. Neither **Goesele et al** nor **Sakaguchi et al** disclose wherein the healing annealing is carried out after the thinning. **Maleville et al** disclose a method of thinning a semiconductor layer by formation of a sacrificial oxide, followed by a healing annealing step [see col. 7, lines 23-30]. It would have been obvious to one of ordinary skill in the art at the time of invention to include a healing annealing step after the thinning process because **Maleville et al** teach that it heals the defects generated by the formation of the surface oxide layer and stabilizes the bonding interface [see col. 7, lines 23-30].

Response to Arguments

5. Applicant's arguments filed 5 March 2010 have been fully considered and they are persuasive in part. On pages 4-5 of the Remarks, Applicants allege that "Goesele takes no interest in the electrical properties of the transferred thin layer. The aim of Goesele is just to transfer the thin layer of monocrystalline material" [emphasis in the original]. The Examiner submits that, while **Goesele et al** do not go into the specifics of the electrical properties of the thin layer formed thereby, it is known in the art that defect density has measurable effects on the electrical properties of an implanted film and furthermore that the conditions of implantation effect the defect density; thus, one of ordinary skill in the art would have been capable of determining optimal implantation conditions in accordance with the electrical properties desired.

On pages 6-7 of the Remarks, Applicants allege that "Usenko describes a method wherein the silicon thin layer is obtained by epitaxial growth on a porous surface. The epitaxial part that is near the porous layer is of bad quality because it contains pores, and it must be eliminated … [T]his feature from Usenko is not applicable to Goesele since there is no epitaxial part with pores to

remove" [emphasis in the original]. The Examiner has applied the teaching of **Sakaguchi et al** in place of the previously-cited reference to **Usenko**; the active layer of **Sakaguchi et al** is formed in a manner more consistent with the teachings of **Goesele et al**.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen E. Snow whose telephone number is (571)272-8603. The examiner can normally be reached on Monday through Friday, 8:00 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Landau can be reached on (571) 272-1731. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C. Landau/
Supervisory Patent Examiner, Art Unit 2813

/C. E. S./
Examiner, Art Unit 2813